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To: **Joe Garman** **Date:** December 5, 1997

From: **Cindy Boswell**

Subject: **pH in Aqueous Solution Repeatability Analysis**

A "repeatability study" has not yet been performed on this test method. However, some of the recent test data can be used to calculate precision statements. A total of 24 samples have been subjected to this test, each sample having been tested 3 times in 1 day. In addition, Industry Monitor #16 (IM#16) was tested twice a day for 7 days for a total of 14 data values.

Using this IM#16 data, the pH values ranged from 5.291 to 5.397.
Repeatability standard deviation for IM#16 was obtained to be given as

$s_r = 0.0295$

resulting in a repeatability value for IM#16 given as

$r = 0.0826$.

These results were obtained following the guidelines specified in ISO guide 5725.
This implies that the difference between two single results found on identical test material by one operator using the same apparatus within the shortest feasible time interval will exceed the repeatability value r (0.08) on average not more than once in 20 cases in the normal and correct operation of the method.

The data used are as follows:

Date	Result #1	Result #2	Average	Variance (s^2)	Range	Range^2
10/29/97	5.342	5.380	5.3610	0.00072	0.038	0.001444
10/30/97	5.370	5.291	5.3305	0.00312	0.079	0.006241
10/31/97	5.364	5.324	5.3440	0.00080	0.040	0.001600
11/11/97	5.397	5.383	5.3900	0.00010	0.014	0.000196
11/12/97	5.345	5.299	5.3220	0.00106	0.046	0.002116
11/13/97	5.314	5.336	5.3250	0.00024	0.022	0.000484
11/20/97	5.367	5.357	5.3620	0.00005	0.010	0.000400

$T_3 = \Sigma R^2 = 0.012181$

$s^2_r = T_3/p = T_3/14 = \mathbf{0.00087007}$

$r = 2.8 \times s_r = 2.8 \times 0.0295 = 0.0826$

Analysis of Variance

Source	SS	df	MS
Between Groups	0.0073	6	0.001218643
Within Groups	0.0061	7	**0.000870071**
Total	0.0134	13	

Note that this analysis was performed on a very small sample size and a complete repeatability and reproducibility study should be performed to better assess the precision of the test method.

cc: Central File

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